

NEXRAD Trigger Logics

An explanation of the triggers and their relative timing for RDA functionality is provided in this report. Start/Stop sequencing and test trigger information is also outlined.

Trigger logics for different sequences of triggers to operate the radar for safe operation and testing.

- Start Sequence
 - Start after RF Pls Start Trigger
- Operational Triggering
 - The trigger sequence will follow the pattern shown on Figure 1
 - This is already implemented at KREX
- Stop Sequence
 - Sent whenever the transmitter stops transmitting (e.g. the system goes from operate to standby)
 - This sequence discharges the modulator by firing the Trigger Amplifier
 - Ensures the Transmitter is de-energised by sending the following 2 trigger sequence:
 - Trigger Charge Trigger
 - Modulator Discharge Trigger
 - These 2 triggers are sent 740 μ s apart
 - Ideally should be sent before any HV OFF
- RFD Sequence
 - This trigger sequence generates an RFD pulse used in receiver testing
 - RF Driver Trigger
 - RF Gate
 - RF Pls Start
 - The timing relationship of these triggers is as defined in Figure 1
 - The PRT of this sequence shall be greater than 667 μ s
- CW
 - The RF Gate signal is also used to generate test CW for the system
 - When CW is generated, the RF Gate signal is kept high all the time
 - This does not have to be high speed like the RF Gate is
- RX Protect
 - There should be a way to turn the RX Protector on instead of gating it
 - This does not have to be a high speed signal, it would only be used for off-line testing
- Other Sequences
 - There are currently no other trigger sequences required by the system

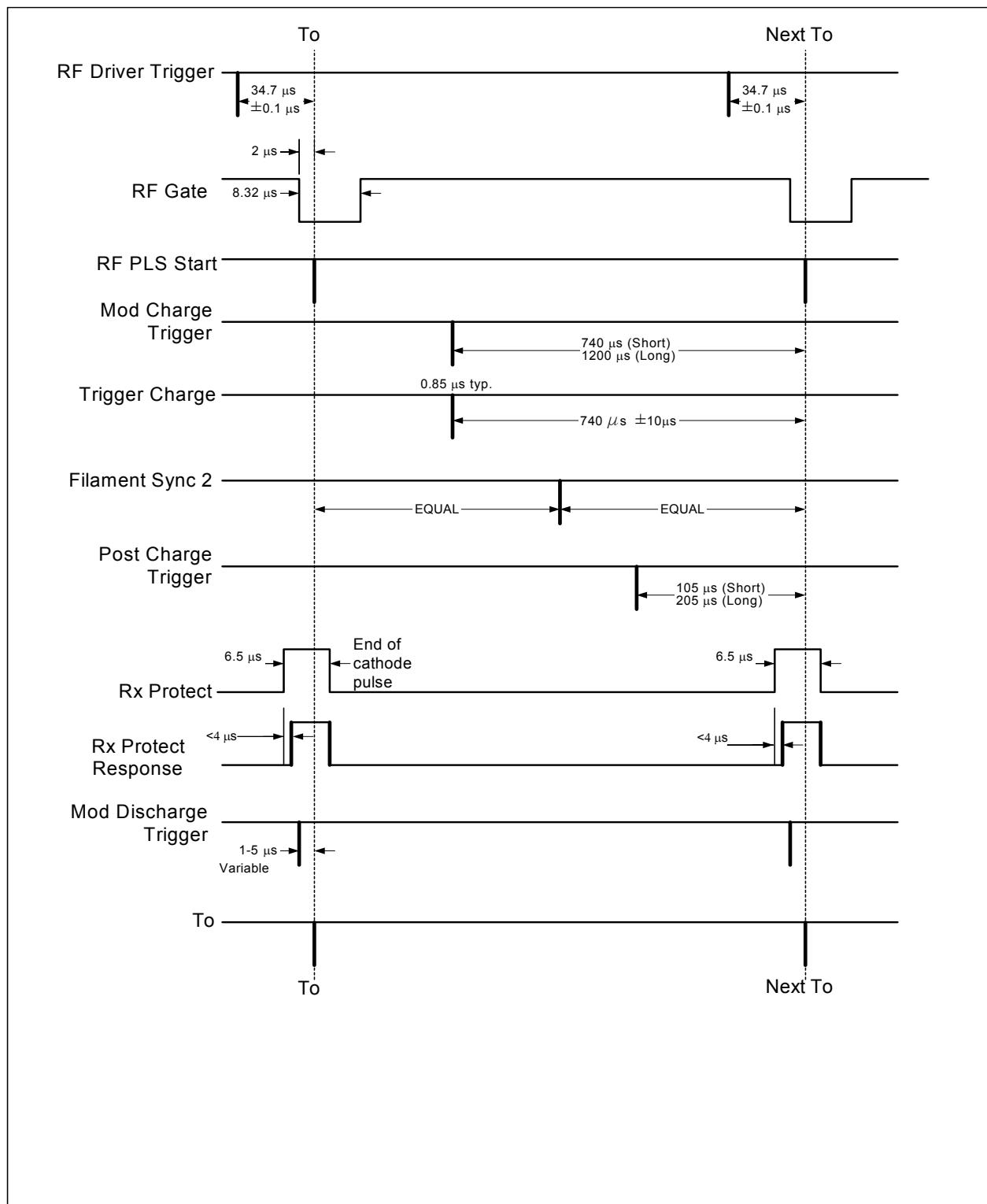


Figure 1: Trigger Timing

Trigger Definitions

RF Driver Trigger controls operation of the RF driver amplifier (UD3A4). The trigger occurs 34.7 μs before T_0 . It gates on the RF Driver via a mono-stable multivibrator for 49 μs then gates it off via a mono-stable multivibrator for 239 μs . The RF Driver amplifies the RF sent from the RF Generator (UD4A1) to approximately 40W and sends it to the RF Pulse Shaper (UD3A5).

RF Gate is 8.32 μs wide and starts approximately 2 μsec before T_0 . This signal gates the RF sent from the RF Generator to the RF Driver. The signal is also split off the RF Generator and used for CW test signal operation.

RF PLS Start generates RF Pulse Shaper operation. The signal coincides with T_0 when transmitting. The RF Pulse Shaper takes RF from the RF Driver and sends a short ($\sim 1.5\mu\text{sec}$) or long ($\sim 4.5\mu\text{sec}$) RF pulse into the klystron for transmission and to the receiver as a test signal.

Mod Charge Trigger starts PFN (UD3A12A6) charging. This signal occurs approximately 740 μs (in short pulse mode) or 1200 μs (in long pulse mode) before T_0 .

Trigger Charge Trigger starts trigger amplifier (UD3A11) charging. This signal occurs 740 μs before T_0 .

Filament Sync2 Trigger is used in conjunction with the RF pulse start trigger to provide synchronous filament power supply operation. This signal ensures that the filament heater AC voltage is zero when the transmitter fires. The signal occurs midway between T_0 triggers (at mid PRT).

Post Charge Trigger starts post charge regulation (UD3A8). The signal occurs 105 μs (for short pulse mode) or at 205 μs (for long pulse mode) before T_0 .

Rx Prot commands the receiver protector (UD2A3) to turn on. This is a gate signal. It starts 6.5 μs before T_0 and ends at the trailing edge of the cathode pulse. When the receiver protector is turned on it provides over 50db of attenuation to received signals. In case the trailing edge of the cathode pulse is not detected, the default width for the Rx Prot signal will be 17 μs . This does not preclude the extension of the Rx Prot signal in case the transmitter is still transmitting beyond the 17 μs pulse width.

Rx Prot Response must be present prior to firing any of the following triggers: RF Gate, Mod Discharge, RF PLS Start. This keeps the transmitter from radiating if the Rx Protector does not work. This signal is the response to the Rx Prot command.

Mod Discharge Trigger fires the trigger amplifier to discharge the PFN. This triggers is 1.2 to 5.8 μs before T_0 and is adjustable. In the Legacy system, the Mod Discharge Trigger is variable in 104 ns increments. This is adjustable to compensate for the alignment of the RF pulse in the Transmitter. The SIGMET trigger generator will allow the same range with an increment of 24 ns. This allows for a much finer adjustment of the Mod Discharge Trigger.

All SIGMET triggers are adjustable within these ranges and meet all Legacy requirements.